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## **480 CONTINUOUS LONGITUDINAL RUMBLE STRIPS**

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### **480.1 INTRODUCTION**

The purpose of this policy is to define when and where continuous longitudinal rumble strips may be applied on the state highway system. Also refer to ADOT ITD policy MGT 02-1 Bicycle Policy.

The purpose of continuous longitudinal rumble strips is to enhance safety by preventing run-off-road (ROR) collisions with fixed object and rollovers due to driver overcorrection type crashes. These rumble strips are intended to alert drivers by creating an audible (noise) and tactile (rumble or vibratory) warning sensation that their vehicle is leaving the traveled way (traffic lane) and that a steering correction is required. Before and after accident studies have indicated that ROR type crashes may be reduced significantly by the use of continuous longitudinal rumble strips.

### **480.2 POLICY**

Continuous longitudinal ground-in rumble strips may be applied to the mainline roadway on projects per the recommendations and requirements of this document.

The following table should be used as a guideline in determining the groove width of the rumble strips to be installed:

<u>Type of Roadway</u>	<u>Right Shoulder Width</u>	<u>Groove Width (both shoulders)</u>
Undivided	less than 4'	6"
Undivided	greater than or equal to 4'	8"
Divided	less than 6'	8"
Divided	greater than or equal to 6'	12"

For divided roadways, the groove width for the left shoulder of the roadway should be the same as the width applied to the right shoulder, where possible.

On undivided two lane highways with shoulders four (4) feet and greater in width, longitudinal rumble strips should be applied. The use of longitudinal rumble strips on shoulders less than four (4) feet may be considered on a case by case basis when supported by a written traffic evaluation.

On divided highways, longitudinal rumble strips should be applied on the right (outside) shoulders with a width of four (4) feet or more and on left (median)

shoulders which have a width of two (2) feet or more. The use of longitudinal rumble strips on divided highways with narrower shoulders than those noted may be considered on a case by case basis when supported by a written traffic evaluation.

**The use of longitudinal rumble strips on all roadway shoulders less than six (6) feet wide with sections of guardrail and/or barrier shall be evaluated. The effective clear width of the shoulder in these areas if a continuous longitudinal rumble strip is installed shall be determined.** The effective clear shoulder width is defined as the distance between the outside edge of the proposed rumble strip and the front face of the guardrail or barrier.

The effective clear shoulder width is important for the following reasons:

- (a) Constructibility - To allow for installation equipment, i.e. grinding, a minimum effective clear shoulder width of two (2) feet is needed from the outside edge of the rumble strip groove to the front face of the barrier or guardrail. If the barrier is on a sharp curve additional width may be needed. This constructibility issue applies to all shoulders and all types of highways.
- (b) Bicycle Traffic - If appreciable bicycle traffic exists or is anticipated then a minimum effective clear shoulder width of three-feet and five-inches (3'-5") should be provided from the outside edge of the rumble strip groove to the front face of the barrier or guardrail. If this clear area can not be maintained then a change of configuration and/or deletion of the rumble strip should be considered.

If these minimum clear shoulder width dimension criteria can not be maintained, then there are four possible solutions that may be considered. These possible solutions should be considered in the order that they are presented here. The first solution is to reevaluate lane widths; if the lanes are wider than 12 feet it may be permissible to reduce their width. The second solution is to move the location of the rumble strip closer to the traveled way and/or use a narrower strip width (6 inch or 8 inch). If the strip is moved closer to the traveled way it shall not infringe on the actual traffic lane. The third solution is to consider using an alternative rumble strip treatment such as profile pavement markings and/or raised pavement markers; this solution only applies to non-snow removal areas. The fourth solution is to omit the use of the longitudinal rumble strip in the area of the guardrail or barrier.

**Details for rumble strip configuration and placement shall be shown on the plans.** Typically the details will be included in conjunction with project striping plans. **In addition, the limits of the various type of improvements shall be indicated on the plans.**

On non-access-controlled highways, newly installed rumble strip on the right shoulder should use a pattern incorporating periodic gaps as shown on standard drawing M-22.

Continuous rumble strips shall be installed on shoulders of all controlled-access highways, and may be installed on shoulders of non-access controlled highways when supported by a written traffic evaluation

Generally, continuous longitudinal rumble strips should not be applied on the shoulders of roadways within developed and urban areas. In suburban and developing areas, the design team should decide whether rumble strips are appropriate. These types of rumble strips can produce noise that may be objectionable to citizens that reside nearby. The use of continuous longitudinal rumble strips in urban areas should only be considered if there are no other reasonable alternatives and/or it is to mitigate a specific area problem.

#### 480.3 OTHER CONSIDERATIONS

Continuous longitudinal rumble strips may be achieved through a number of different techniques and patterns (e.g. formed rumble strip, raised pavement markers like ceramic buttons, or profile pavement markings). This policy is not intended to restrict or prohibit the use of any of these other alternatives. If an alternative technique is shown to offer an advantage over the ground-in rumble strip, then its use may be pursued.

Ground-in rumble strip can be installed in portland cement concrete pavement (PCCP). However, at the writing of this policy it still has not been done in Arizona. Grinding of PCCP requires a diamond tip saw blade grinding drum that is water cooled. The grinding of asphaltic cement pavement (ACP) can be done with a steel grinding drum without water cooling. Thus, doing PCCP ground-in rumble strip would require a significantly different operation and payment structure than what is currently reflected in ADOT's ACP grinding practice. Careful study needs to be given prior to the application of ground-in rumble strip on PCCP.

The make-up of the new pavement or the thickness, condition, and type of existing pavement needs to be determined prior to the application of ground-in rumble strip. The installation of ground-in rumble strip on pavement that is of questionable thickness, condition, or type (e.g. AC over PCCP) needs to be evaluated to ensure that the installation of the rumble strip will be possible without adverse impact to the pavement or the performance of the strip.

This policy or the rumble strip standard drawings do not account for all possible applications (e.g. rural gore areas). Therefore, it may be necessary for the designer to develop special application plans or details for the application of ground-in or alternative longitudinal rumble strip treatments. **All such plans and details shall be submitted to the Traffic Engineering Group for review and approval prior to their use on a project.** This includes the use of centerline rumble strip on two-way highways.

#### 480.4 WRITTEN TRAFFIC EVALUATION

**The use of continuous longitudinal rumble strips on roadways with shoulders less than four (4) feet shall require a written traffic evaluation approved by the Manager of the HES Section.**